4398/fdl

APPLICATION

of

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for

CONTROLLED-RELEASE PESTICIDAL COMPOSITION AND METHOD OF MAKING

BE IT KNOWN, that WE, GARRARD L. HARGROVE and JOHN H. DETRICK, citizens of the United States of America and residing at 5032 Wagon Trace, Birmingham, Alabama 35242, United States of America; and 5716 East Bay Boulevard, Gulf Breeze, Florida 32563, United States of America, respectively, have invented the following:

FIELD OF INVENTION

This invention is directed to a composite granular material tailored to release, upon application to soil, plants or the like, a pesticide in a controlled manner. More particularly, the invention is directed to a particulate material comprising a "core" such as ammonium sulfate which is coated under controlled conditions with a select polymeric membrane and a pesticide such as acephate. A controlled-release polymer membrane is applied as an outer membrane. The material is stable when stored, but will release pesticide at a controlled rate when applied to a plant or the like material in a field environment.

BACKGROUND OF THE INVENTION

In recent years, because of ecological concerns as well as the need for controlled release of fertilizers, pesticides and the like materials for economical reasons, there has been a concerted effort to coat fertilizers as well as pesticidal materials with polymer coatings which will permit a controlled release of the material upon application to plants or the like in a field environment.

For example, U.S. Patent No. 6,060,076 discloses methods and devices for providing long-term protection from intrusion by insects and other cold-blooded animals involving

a polymeric matrix and a pesticide contained therein.

Further, U.S. Patent No. 5,939,376 discloses a controlled-release coated agricultural product including agricultural chemicals, seed, or mixtures thereof with a coating of an environmentally degradable amorphous copolymer. A process of making such products involves making the product with a molten copolymer and then cooling to harden the coating of copolymer upon the agricultural product.

U.S. Patent No. 4,056,610 discloses a microcapsule insecticide composition including microcapsules, each having a polyurea shell with a photostable ultraviolet light-absorbing compound as an integral part of the shell and a liquid fill capable of slowly permeating the shell of a pyrethroid and a biologically synergist thereof. When the polymer is applied as an insecticide, the pyrethroid releases slowly depending upon the thickness and porosity of the capsule wall.

U.S. Patent No. 4,223,070 discloses filled porous granules sealed with a porous polyurethane membrane entrapping therein a liquid material. The material is allowed to diffuse from the granules at a controlled rate. The porous granules which are partially miscible with water have applied thereto an organic solution comprising the material to be entrapped, an organic polyisocyanate, and a catalytic amount of a catalyst for catalyzing the polymeric

reaction.

U.S. Patent No. 6,080,221 discloses a method of coating fertilizer particles exhibiting porous surfaces under vacuum to form controlled-release particulate fertilizers by drawing a vacuum on the fertilizer particles and applying thereto a water-insoluble resin at atmospheric pressure and then hardening the fluid resin to form a solid resin. Pesticides may be coated using the disclosed method.

While these described products are recognized to provide certain improvements with respect to the release of insecticides and the like, the formulations in most respects are difficult to produce, lack essential properties in a controlled-release product, or simply can stand improvement.

In a related field it has also been recognized that a fertilizer product, such as urea, can be applied to a soil environment in order to control the release of the fertilizer over a period of time. This permits a single application of the fertilizer which will last several months and possibly an entire growing season, avoiding the need for further applications. For example, U.S. Patent Nos. 4,716,659; 4,804,403, and 4,969,947, in the name of William P. Moore and now assigned to the assignee of the present application, disclose an attrition-resistant, controlled-release fertilizer comprising a water-soluble central mass, such as urea, containing nucleophilic reaction functional groups

surrounding and chemically bonded to a base coating formed by reacting a molecular excess of a coupling agent, such as a polyisocyanate, with the nucleophilic groups of the central mass and a water-insoluble layer surrounding and chemically bonded with the base coating formed by the reaction and polymerization of the excess functional groups of the coupling agent. These products provide outstanding controlled-release fertilizer products.

The present invention is directed to further improved pesticidal materials having controlled-release characteristics when compared with the known materials described in the known prior art.

SUMMARY OF THE INVENTION

In accordance with the present invention, pesticidal products are manufactured having excellent controlled release of the pesticide by bonding the pesticide or a pesticide mixture to a "core" material such as ammonium sulfate using reactive polymer-forming components. Specifically, a core granule has applied thereto an inner polymer membrane. A pesticide or pesticide mixture is applied to the polymer membrane on the core material and bonded thereto, preferably using the reactive components of a polymer matrix. An outer controlled-release polymeric membrane is applied to the inner polymer matrix. The outer

controlled-release membrane is formed by using reactive components, such as a polyisocyanate and a polyol such as a polyester. The components of the membrane are controlled so as to permit controlled release of the pesticide and possibly the core granular material when applied to the soil where the product is in contact with moisture.

For convenience, the present invention will be described with reference to an insecticide as the pesticide, and specifically acephate; ammonium sulfate as the granular core material, and a polyurethane as both the inner membrane and the outer controlled-release membrane. It is to be understood, however, that other granular materials such as urea, potassium chloride, clay and the like can be utilized as the core material. Ammonium sulfate is, however, a highly preferred material and provides an excellent pesticidal composition. Further, in addition to using acephate as the pesticide, other pesticides can be utilized, including other insecticides, as well as other components including herbicides, fungicides, plant growth regulators, and the like. The selection of acephate as the pesticide and ammonium sulfate as the granular core material is due to the excellent product formed with these materials and for convenience of description.

DETAILED DESCRIPTION OF THE INVENTION

The present invention will be described with respect to a controlled-release pesticidal material comprising ammonium sulfate as the "core" material, an inner polymer membrane surrounding the core granular material, acephate as the pesticide, and a polyurethane membrane as a controlled-release membrane. In Examples 1 and 2 which follow, these materials are utilized. It is to be understood, however, that modifications can be made in addition to components used with respect to the number of coatings applied to the core material and to the amount of active component utilized.

EXAMPLE 1

Description of Manufacture of Controlled-Release Acephate Referred to as Type 10 TC (Target Acephate Content = 4.3%)

The inner "core" granule is ammonium sulfate. The application of the inner polymer membrane, the bonding procedure and the coating procedure are carried out as follows:

Application of Inner Polymer Membrane and Bonding Procedure:

(1) 2000 pounds of ammonium sulfate granules (average particle size = 1.7 mm) are charged to a rotary drum. The temperature of the granules is kept at 90±10°F.

(2) The rotary drum is turned on and its speed is adjusted to 10 rpm.

(3) 0.43 pounds of polymeric diphenylmethane diisocyanate (p-MDI) (see specifications below) are injected beneath the surface of the rolling bed of ammonium sulfate granules. The p-MDI is allowed to spread over the surface of the granules for one minute.

(4) 2.19 pounds of a polyester polyol/triethanolamine 90%/10% blend (see specifications below) are injected beneath the surface of the rolling bed of ammonium sulfate granules and allowed to spread over the surface of the granules for one minute.

At the conclusion of the above step (4), the p-MDI and polyester polyol/triethanolamine blend have reacted to form the inner polymer membrane.

(5) 9.76 pounds of a fine powder (95% of particles smaller than 0.0029 inch), composed of 1.5% precipitated silica and 98.5% of a commercial pesticide formulation of acephate containing 90% acephate active ingredient, are added to the rolling bed of granules coated with the polyurethane produced in steps (3) and (4). The added powder is allowed to spread over the surface of the coated granules for three minutes.

Acephate active ingredient is O,S-Dimethyl acetylphosphoramidothioate.

(6) 0.67 pounds of p-MDI are injected beneath the rolling bed of granules from step (5), and allowed to spread over the surface of the granules for one minute.

(7) 0.48 pounds of precipitated silica are added to the rolling granules from step (6), and allowed to spread over the surface of the granules for one minute.

(8) Steps (3) - (7) are repeated once, namely

(a) 0.43 pounds of p-MDI are injected beneath the surface of the rolling bed of granules from Step (7). The p-MDI is allowed to spread over the surface of the granules for one minute.

(b) 2.19 pounds of a polyester polyol/triethanolamine 90%/10% blend are injected beneath the surface of the granules from step 8(a) and allowed to spread over the surface of the granules for one minute.

(c) 9.76 pounds of a fine powder (95% of particles smaller than 0.0029 inch), composed of 1.5% precipitated silica and 98.5% of a commercial pesticide formulation of acephate containing 90% acephate active ingredient, added to the

rolling bed of granules from step 8(b). The added powder is allowed to spread over the surface of the coated granules for three minutes.

(d) 0.67 pounds of p-MDI are injected beneath the rolling bed of granules from step 8(c), and allowed to spread over the surface of the granules for one minute.

(e) 0.48 pounds of precipitated silica are added to the rolling granules from step 8(d), and allowed to spread over the surface of the granules for one minute.

(9) 0.91 pounds of a p-MDI are injected into the rolling bed of granules from step (8). The p-MDI is allowed to spread over the granule surface for one minute.

(10) 4.33 pounds of a polyester polyol/triethanolamine 90%/10% blend are injected beneath the surface of the rolling bed of granules from step (9). The polyol blend is allowed to spread over the surface of the granules for one minute.

(11) 19.52 pounds of the acephate/silica powder blend are added to the rolling bed of granules from step (10), and allowed to spread over the surface of the granules for three minutes.

(12) 1.29 pounds of p-MDI are injected beneath the surface of the rolling granules from step (11). The p-MDI is allowed to spread over the surface of the granules for one minute.

(13) 0.95 pounds of precipitated silica are added to the rolling bed of granules from step (12). The silica is allowed to spread over the surface of the granules for one minute.

(14) Steps (9) - (13) are repeated four more times.

Outer Coating Procedure to Produce 10% Controlled-Release Membrane:

(1) The granules produced via the above "Inner Polymer Membrane and Bonding Procedure" are heated to 150±10°F and are maintained at this temperature during the coating procedure.

(2) 2.85 pounds of p-MDI are injected under the surface of the rolling bed of heated rolling granules. The p-MDI is allowed to spread over the surface of the granules for one minute.

(3) 6.42 pounds of a 90%/10% blend of polyester polyol and triethanolamine are injected under the surface of the rolling bed of heated rolling granules. The polyol blend is allowed to spread over the surface of the granules for two minutes.

(4) 4.29 pounds of p-MDI are injected below the surface of the rolling bed of heated rolling granules. The p-MDI is allowed to spread over the surface of the granules for one minute.

(5) Steps (2) - (4) are repeated sixteen (16) more times to produce a total of seventeen (17) polyurethane "layers."

(6) 2.09 pounds of molten wax (see specifications below), a plasticizer for the polyurethane coating, are injected into the hot rolling bed of granules after polyurethane "layers" 3, 6, 9, 12 and 15. Each wax injection is allowed to spread over the surface of the granules for one minute.

Theoretical Yield = 2,403 pounds

Actual Yield = 2,396 pounds
(99.7% of theoretical yield)

Outer Coating Target = 10 weight%

Target Acephate Content = 4.3 weight%

Product Longevity = 4 months @20°C and
(acephate activity) 2 months @30°C.

Specifications:

(1) p-MDI	NCO content, wt.%.....	31-33
	Viscosity @25°C, cps.....	50-200
	Equivalent wt., grams.....	130-133
	Functionality.....	2.4-2.8
(2) Polyester polyol	Equivalent wt., grams.....	220-250
	Viscosity @25°C, cps.....	2000-4500
	Functionality.....	2

(3) Triethanolamine	triethanolamine, wt%, min...	97.0
	ethanolamine, wt.%, max.....	0.5
	diethanolamine, wt.%, max...	3.0
	water, wt.%, max.....	0.2
(4) Wax (transitional paraffin)	lbs/gallon.....	6.2-6.4
	Viscosity @100°C, cSt.....	7.1-8.5
	Dropping point, °F.....	160-168
	Oil content, wt.%, max.....	3.0
	Needle penetration @77°F, 0.1mm.....	13-15

EXAMPLE 2

Description of Manufacture of Controlled-Release Acephate Referred to as Type 18 TC (Target Acephate Content = 4.3%)

The inner "core" granule is ammonium sulfate. The application of the inner polymer membrane, the bonding procedure and the coating procedure are carried out as follows:

Application of Inner Polymer Membrane and Bonding Procedure:

(1) 1,808.44 pounds of ammonium sulfate granules (average particle size = 1.7 mm) are charged to a rotary drum. The temperature of the granules is kept at 90±10°F.

(2) The rotary drum is turned on and its speed is adjusted to 10 rpm.

(3) 0.43 pounds of p-MDI are injected beneath the surface of the rolling bed of ammonium sulfate

granules. The p-MDI is allowed to spread over the surface of the granules for one minute.

(4) 2.19 pounds of a polyester polyol/triethanolamine 90%/10% blend are injected beneath the surface of the rolling bed of ammonium sulfate granules and allowed to spread over the surface of the granules for one minute.

At the conclusion of step (4), the p-MDI and polyester polyol/triethanolamine blend have reacted to form the inner polymer membrane.

(5) 9.76 pounds of a fine powder (95% of particles smaller than 0.0029 inch), composed of 1.5% precipitated silica and 98.5% of a commercial pesticide formulation of acephate containing 90% acephate active ingredient, are added to the rolling bed of granules coated with the polyurethane produced in steps (3) and (4). The added powder is allowed to spread over the surface of the coated granules for three minutes.

Acephate active ingredient is O,S-Dimethyl acetylphosphoramidothioate.

(6) 0.67 pounds of p-MDI are injected beneath the rolling bed of granules from step (5), and allowed to spread over the surface of the granules for one minute.

(7) 0.48 pounds of precipitated silica are added to the rolling granules from step (6), and allowed to spread over the surface of the granules for one minute.

(8) Steps (3) - (7) are repeated once, namely

(a) 0.43 pounds of p-MDI are injected beneath the surface of the rolling bed of granules from Step (7). The p-MDI is allowed to spread over the surface of the granules for one minute.

(b) 2.19 pounds of a polyester polyol/triethanolamine 90%/10% blend are injected beneath the surface of the granules from step 8(a) and allowed to spread over the surface of the granules for one minute.

(c) 9.76 pounds of a fine powder (95% of particles smaller than 0.0029 inch), composed of 1.5% precipitated silica and 98.5% of a commercial pesticide formulation of acephate containing 90% acephate active ingredient, are added to the rolling bed of granules from step 8(b). The added powder is allowed to spread over the surface of the coated granules for three minutes.

(d) 0.67 pounds of p-MDI are injected beneath the rolling bed of granules from step 8(c), and

allowed to spread over the surface of the granules for one minute.

(e) 0.48 pounds of precipitated silica are added to the rolling granules from step 8(d), and allowed to spread over the surface of the granules for one minute.

(9) 0.91 pounds of a p-MDI are injected into the rolling bed of granules from step (8). The p-MDI is allowed to spread over the granule surface for one minute.

(10) 4.33 pounds of a polyester polyol/triethanolamine 90%/10% blend are injected beneath the surface of the rolling bed of granules from step (9). The polyol blend is allowed to spread over the surface of the granules for one minute.

(11) 19.52 pounds of the acephate/silica powder blend are added to the rolling bed of granules from step (10), and allowed to spread over the surface of the granules for three minutes.

(12) 1.29 pounds of p-MDI are injected beneath the surface of the rolling granules from step (11). The p-MDI is allowed to spread over the surface of the granules for one minute.

(13) 0.95 pounds of precipitated silica are added to the rolling bed of granules from step (12). The silica

is allowed to spread over the surface of the granules for one minute.

(14) Steps (9) - (13) are repeated four more times.

Outer Coating Procedure to Produce 18% Controlled-Release Membrane:

(1) The granules produced via the above "Inner Polymer Membrane and Bonding Procedure" are heated to 150±10°F and are maintained at this temperature during the coating procedure.

(2) 2.64 pounds of p-MDI are injected under the surface of the rolling bed of heated rolling granules. The p-MDI is allowed to spread over the surface of the granules for one minute.

(3) 5.94 pounds of a 90%/10% blend of polyester polyol and triethanolamine are injected below the surface of the rolling bed of heated rolling granules. The polyol is allowed to spread over the surface of the granules for two minutes.

(4) 3.96 pounds of p-MDI are injected under the surface of the rolling bed of heated rolling granules. The p-MDI is allowed to spread over the surface of the granules for one minute.

(5) Steps (2) - (4) are repeated thirty-two (32) times to produce a total of thirty-three (33) polyurethane "layers."

(6) 2.34 pounds of molten wax, a plasticizer for the polyurethane coating, are injected into the hot rolling bed of granules after polyurethane "layers" 3, 7, 11, 15, 19, 23, 27 and 31. Each wax injection is allowed to spread over the surface of the granules for one minute.

Theoretical Yield = 2,403 pounds

Actual Yield = 2,384 pounds (99.2% of theoretical yield)

Outer Coating Target = 18 weight%

Target Acephate Content = 4.3 weight%

Product Longevity (Acephate activity) = 8 months @20°C and 4 months @30°C.

It is to be understood with respect to the present invention that the granular "core" material can have various particle sizes. The different particle sizes are chosen in order to meet specific applications as will be known to one skilled in the art.

The effectiveness of the granular pesticides of the present invention are as illustrated in Tables A through G. The pesticides tested are those referred to above in Examples 1 and 2, namely Type 10 TC (Example 1) and Type 18 TC

(Example 2). These pesticides were manufactured and tested by Pursell Technologies, Inc. ("PTI"), Sylacauga, Alabama. The pesticides were tested in turf. The effectiveness of the pesticides of the invention are compared with Orthene® Tree and Ornamental 75% SP which contains 75% acephate as the active ingredient, except in Table G which also compares the pesticides of the invention with Orthene® Turf, Tree and Ornamental Spray 97 which contains 97% acephate active ingredient; Pinpoint 15 G which contains 15% acephate active ingredient in a granular form, and Battle 9.7 CS which contains Lambda-cyhalothrin, a synthetic pyrethroid. The Orthene product is a sprayable product and was applied to the turf in the tests referred to in Tables A - E upon the detection of the presence of the pests. In some instances, the Orthene spray was applied on more than one occasion as referred to in the Tables A - E. The days after treatment in the Tables A - E refer to days after treatment of the PTI product of Examples 1 and 2. Abbreviations used in the Tables A through G are as follows:

10% TC - 4% G = Example 1 Controlled-Release Acephate

18% TC - 4% G = Example 2 Controlled-Release Acephate

PTI = Pursell Technologies, Inc. of Sylacauga, Alabama

Orthene or Orthene T&O 75% SP = Orthene® Tree and Ornamental 75% SP containing 75% acephate active ingredient

Orthene TTO 97% S = Orthene® Turf, Tree and Ornamental Spray 97 contains, 97% acephate active ingredient

Pinpoint 15 G = Pinpoint® 15 G which contains 15% acephate active ingredient in granular form

Battle 9.7 CS = Battle Lamba-cyhalotrin which is a synthetic pyrethroid

Untreated = Turf check sample not treated with any pesticide

Lbs ai/A = Pounds of active ingredient applied per acre

Lbs Product/A = Pounds of product applied per acre

DAT = Days after treatment

WAT = Weeks after treatment

TABLE A

Field Research Data on Acephate Products of Examples 1 and 2

Haig Point Golf Club - Daufuskie Island, SC
PTI Treatments Applied May 30, 2000
Orthene Sprayable Treatments Applied on June 28 and July 20, 2000

			PERCENT MOLE CRICKET CONTROL					
Treatments	Rate	Rate	30-May	21-Jun	12-Jul	27-Jul	14-Aug	8-Sept
	Lbs ai/A	Lbs Product/A	0 DAT	22 DAT	43 DAT	58 DAT	76 DAT	101 DAT
10% TC - 4% G	4	100	0	93	100	89	81	83
10% TC - 4% G	8	200	0	100	100	100	98	97
18% TC - 4% G	4	100	0	96	100	84	81	81
18% TC - 4% G	8	200	0	97	100	100	98	97
Orthene T&O 75% SP	4 + 4	NA	-	-	48	54	39	34
Untreated	0	0	0	0	0	0	0	0

TABLE B

Field Research Data on Acephate Products of Examples 1 and 2

Country Club of Hilton Head - Hilton Head Island, SC
PTI Treatments Applied June 6, 2000
Orthene Sprayable Treatments Applied on June 29 and July 21, 2000

				PERCENT IMPORTED FIRE ANT CONTROL			
Treatments	Rate	Rate		26-Jul	14-Aug	7-Sept	
	Lbs ai/A	Lbs Product/A		50 DAT	69 DAT	93 DAT	
10% TC - 4%	4	100		93	77	58	
10% TC - 4%	8	200		100	85	77	
18% TC - 4%	4	100		77	100	87	
18% TC - 4%	8	200		100	100	100	
Orthene T&O 75%SP	4 + 4	NA		27	28	11	
Untreated	0	0		0	0	0	

TABLE B - CONTINUED

PERCENT MOLE CRICKET CONTROL

Treatments	Rate	Rate	6-Jun	27-Jun	14-Jul	26-Jul	14-Aug	7-Sept
	Lbs ai/A	Lbs Product/A	0 DAT	21 DAT	38 DAT	50 DAT	69 DAT	93 DAT
10% TC - 4%	4	100	0	78	100	89	85	76
10% TC - 4%	8	200	0	100	100	92	90	79
18% TC - 4%	4	100	0	88	100	76	93	77
18% TC - 4%	8	200	0	100	100	100	99	88
Orthene T&O 75%SP	4 + 4	NA	-	-	0	68	25	19
Untreated	0	0	0	0	0	0	0	0

TABLE C

Field Research Data on Acephate Products of Examples 1 and 2

St. Simons Island Golf Club - St. Simons Island, GA
PTI Treatments Applied on June 12, 2000 Both Broadcast Surface Versus Subsurface Injected
Orthene Sprayable Applied on June 12 and June 26, 2000.

PERCENT MOLE CRICKET CONTROL

Treatments	Rate	Rate		Surface	Injected	Surface	Injected
	Lbs ai/A	Lbs Product/A	12-Jun	26-Jun		10-Jul	
			0 DAT	2 WAT		4 WAT	
10% TC - 4% G	4	100	0	59	87	91	90
10% TC - 4% G	8	200	0	92	98	93	97
18% TC - 4% G	4	100	0	82	96	52	89
18% TC - 4% G	8	200	0	100	100	95	100
Orthene T&O 75% SP	4 + 4	NA	0	13	1	74	61
Untreated	0	0	0	0	0	0	0

TABLE C - CONTINUED

PERCENT MOLE CRICKET CONTROL

Treatments	Rate	Rate	Surface	Injected	Surface	Injected	Surface	Injected
	Lbs ai/A	Lbs Product/A	24-Jul		7-Aug		21-Aug	
			6 WAT		8 WAT		10 WAT	
10% TC - 4% G	4	100	92	97	86	98	68	80
10% TC - 4% G	8	200	100	100	99	100	85	87
18% TC - 4% G	4	100	84	93	88	91	68	83
18% TC - 4% G	8	200	100	100	97	100	83	96
Orthene T&O 75% SP	4 + 4	NA	85	71	55	53	47	47
Untreated	0	0	0	0	0	0	0	0

TABLE D

Field Research Data on Acephate Products of Examples 1 and 2

St. Simons Island Golf Club - St. Simons Island, GA
PTI Treatments Applied on June 26, 2000
Orthene Sprayable Treatments Applied On June 26 and July 10, 2000

PERCENT MOLE CRICKET CONTROL

Treatments	Rate	Rate	26-Jun	10-Jul	24-Jul	7-Aug	21-Aug
	Lbs ai/A	Lbs Product/A	0 WAT	2 WAT	4 WAT	6 WAT	8 WAT
10% TC - 4% G	4	100	0	50	93	84	75
10% TC - 4% G	8	200	0	62	99	96	88
18% TC - 4% G	4	100	0	69	92	83	73
18% TC - 4% G	8	200	0	83	100	98	86
Orthene T&O 75% SP	4 + 4	NA	0	94	95	67	31
Untreated	0	0	0	0	0	0	0

TABLE E

Field Research Data on Acephate Products of Examples 1 and 2

University of Florida - Milton, FL
PTI Treatments Applied on July 18, 2000
Orthene Sprayable Treatments Applied on August 10 and September 1, 2000

			PERCENT MOLE CRICKET CONTROL			
Treatments	Rate	Rate	18-Jul	3-Aug	25-Aug	12-Sept
	Lbs ai/A	Lbs Product/A	0 DAT	2 WAT	5 WAT	8 WAT
10% TC - 4% G	4	100	0	0	50	64
10% TC - 4% G	8	200	0	47	79	72
18% TC - 4% G	4	100	0	0	61	76
18% TC - 4% G	8	200	0	12	72	81
Orthene T&O 75% SP	4 + 4	NA	0	0	26	55
Untreated	0	0	0	0	0	0

TABLE F

Field Research Data on Acephate Products of Examples 1 and 2

Imported Red Fire Ant Control at USDA, APHIS
Plant Protection Station, Gulfport, MS
PTI treatments applied on August 10, 2000

PERCENT IMPORTED FIRE ANT CONTROL
% Decrease in Number of Colonies

Treatments	Rate	Rate		Test 1	Test 2	
	Lbs ai/A	Lbs Product/A		6 WAT	6 WAT	
10% TC - 4% G	4	100		57	59	
10% TC - 4% G	8	200		77	87	
18% TC - 4% G	4	100		60	63	
18% TC - 4% G	8	200		78	85	
Untreated	0	0		43	47	

TABLE G

Field Research Data on Acephate Products of Examples 1 and 2

Late Season Adult Mole Cricket Control - Savannah, Georgia
All Treatments Applied on September 28, 2000
Mole crickets = 5th Stage Adult at Application Time

		PERCENT MOLE CRICKET CONTROL							
Product	Lbs ai/A	PRE	1 WAT	2 WAT	3 WAT	4 WAT	8 WAT	12 WAT	16 WAT
Orthene TTO 97% S	3.88	4	65	93	77	49	49	39	41
Pinpoint 15 G	4.05	9	81	100	82	89	60	59	51
Battle 9.7 CS	0.1375	0	76	99	90	90	72	67	56
10% TC - 4% G	3	0	58	100	81	80	55	75	68
10% TC - 4% G	4	0	57	99	90	92	88	100	92
10% TC - 4% G	5	0	72	100	95	98	97	100	100
Untreated Check		0	0	0	0	0	0	0	0

Table A compares the effectiveness of Examples 1 and 2 to commercial product, i.e., Orthene Tree and Ornamental 75% SP, with respect to mole cricket control in turf. Also shown are the results where no treatment is made. The tests were carried out by surface application to turf at Haig Point Golf Club, Daufuskie Island, South Carolina. As will be apparent, the products of the present invention are greatly superior to either the use of Orthene Tree and Ornamental or no treatment.

Table B similarly compares the imported fire ant control and the mole cricket control of Examples 1 and 2 of this invention to that achieved with Orthene Tree and Ornamental 75% SP. Also shown are the results where no treatment is made. The tests were carried out by surface application at Country Club of Hilton Head, Hilton Head Island, South Carolina.

Table C is similar to Table B, but includes a different method of application. Specifically the products of Examples 1 and 2 were applied both by the broadcast method over the surface and were applied by injection into the subsurface. However, the advantages and effectiveness of the pesticides of the present invention are readily apparent. The tests were carried out at St. Simons Island Golf Club, St. Simons Island, Georgia.

Table D is similar to Tables A and B, and records tests carried out at St. Simons Island Golf Club, St. Simons Island, Georgia, and again shows the effectiveness of the pesticides of the present invention over commercial products.

Table E reporting tests carried out at the University of Florida, Milton, Florida, again establishes the effectiveness of the pesticides of the present invention versus commercial products for mole cricket control.

Table F establishes the effectiveness of the products of the present invention for the control of imported red fire ants conducted at the Plant Protection Station, Gulfport, Mississippi.

Table G establishes the effectiveness of the products of the invention for late season adult mole cricket control. The advantages of the claimed invention over commercial products are established.

It will be understood by those skilled in the art that the granular core material can have various particle sizes, with the different particle sizes being chosen in order to meet specific applications as will be known to one skilled in the art. Further, the number of coatings applied will determine the amount of pesticide applied. The amount of pesticide applied will vary according to the needs of a particular application.

As will be apparent to one skilled in the art, various modifications can be made within the scope of the aforesaid description. Such modifications being within the ability of one skilled in the art form a part of the present invention and are embraced by the appended claims.